Smart-Its

Everyday objects made smart

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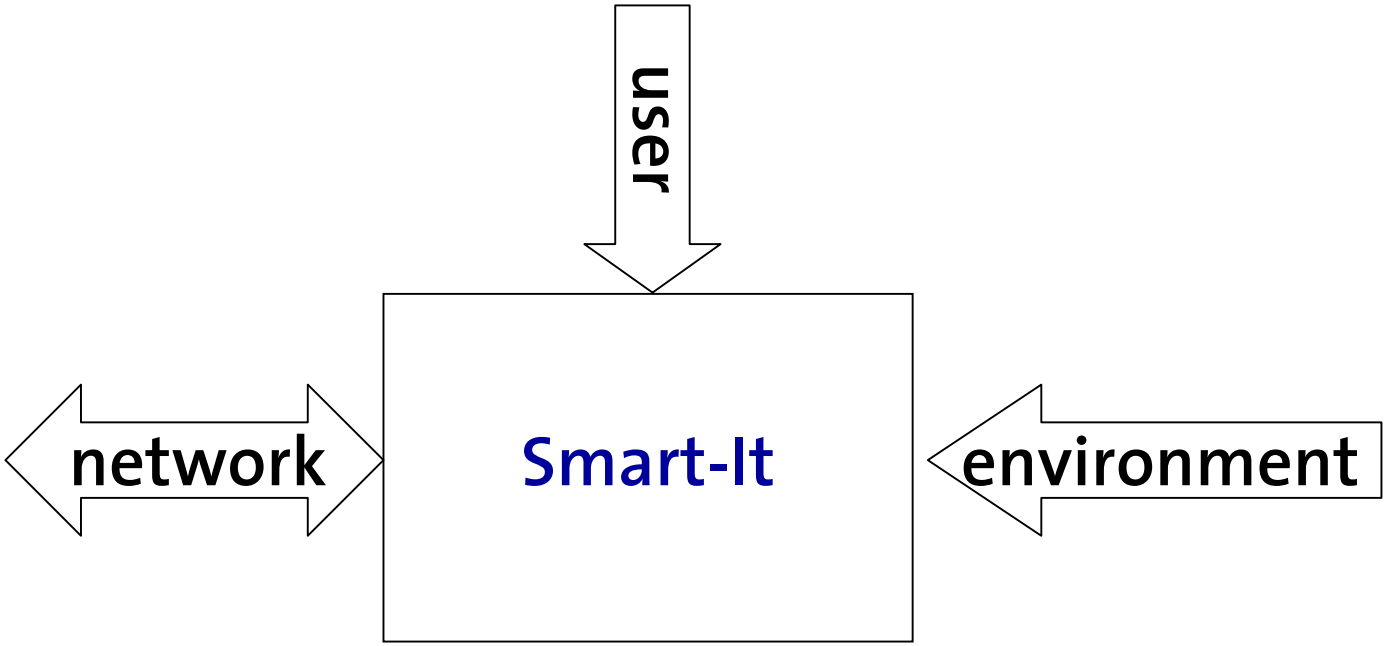
ETH Zurich

RESEARCH GROUP FOR
Distributed Systems

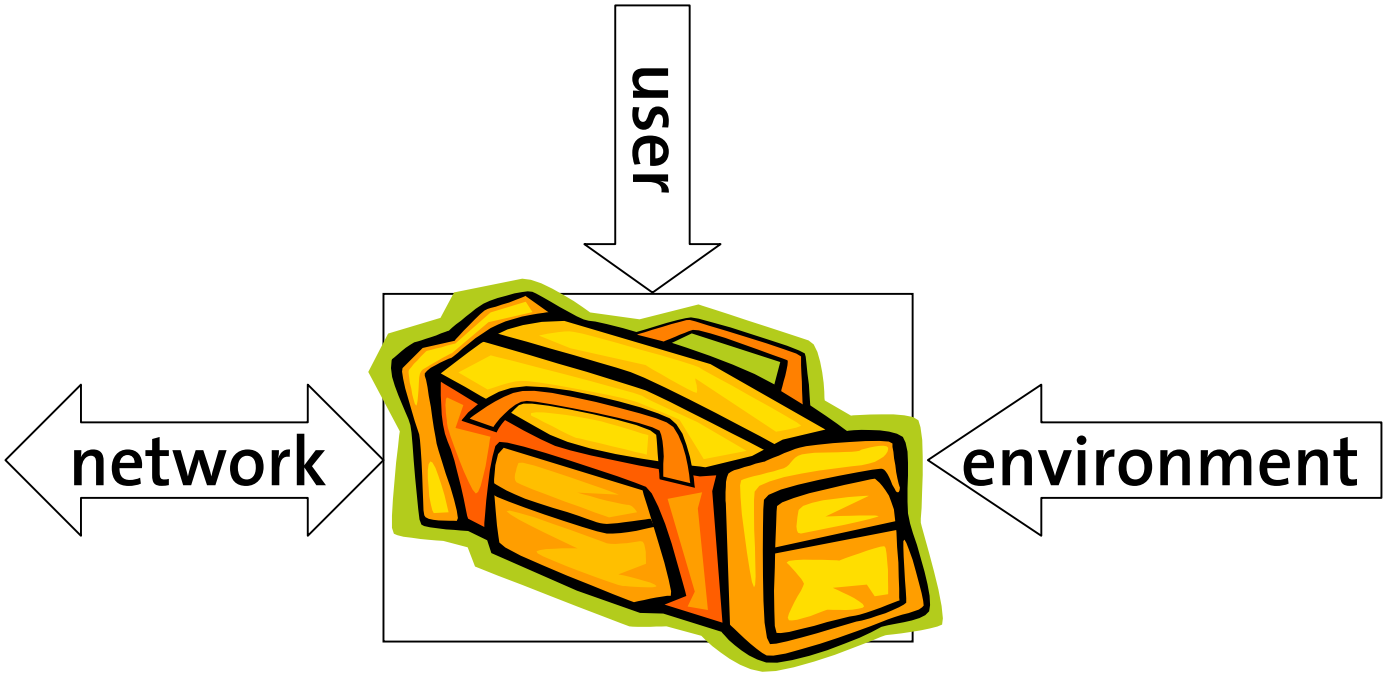
ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Vision



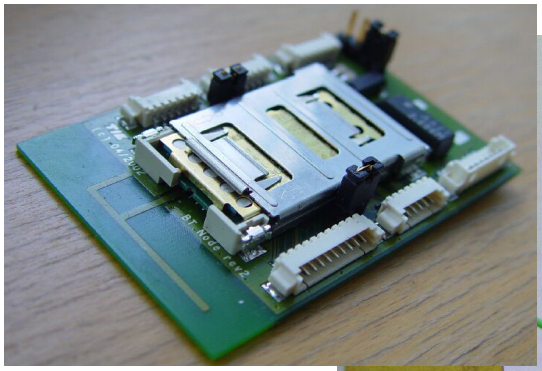
communication & sensing
& computation

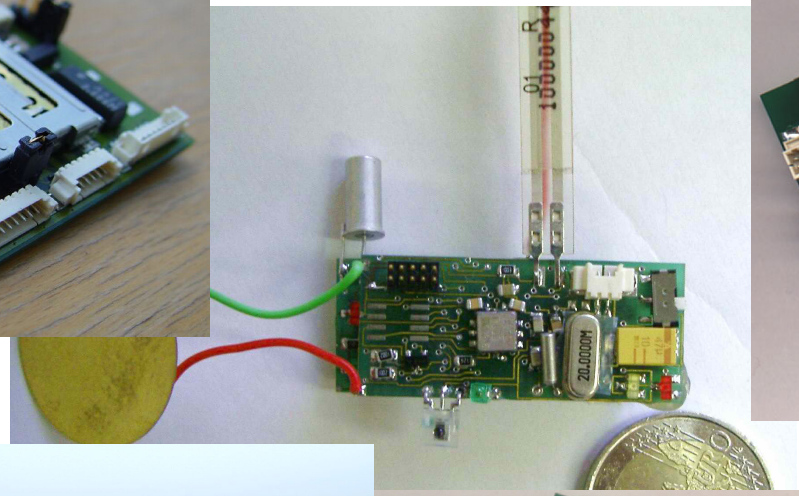
Vision

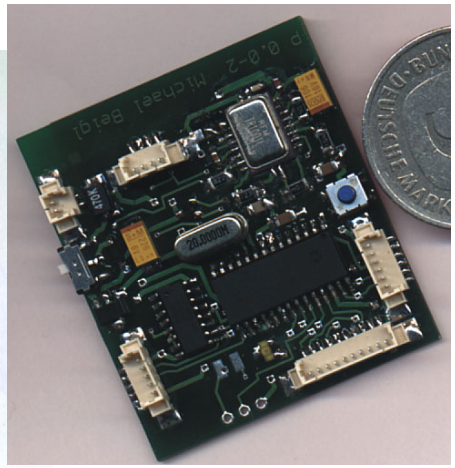


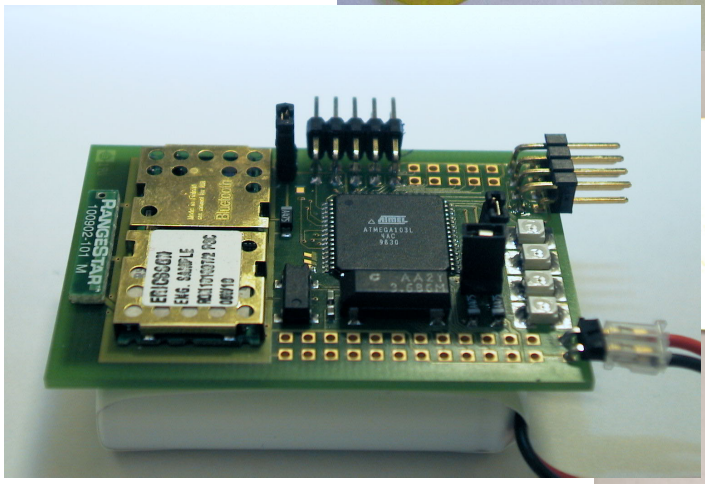
communication & sensing
& computation

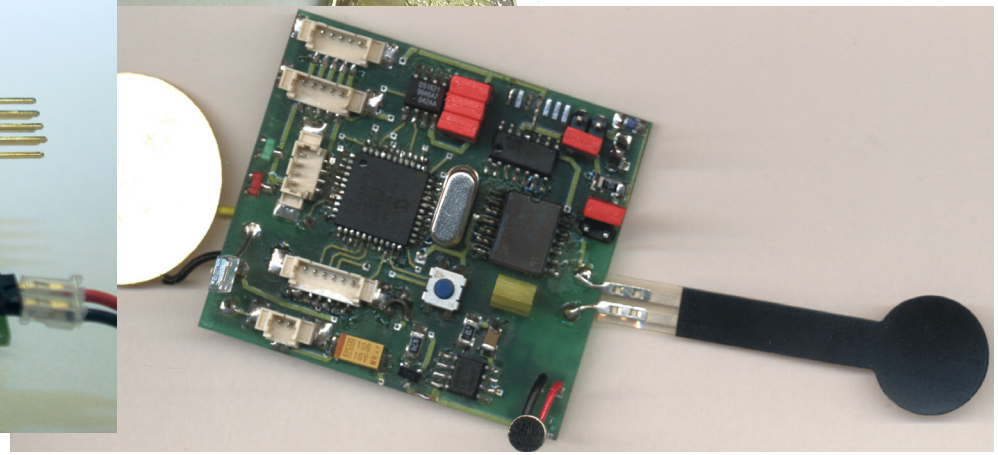
Prototypes





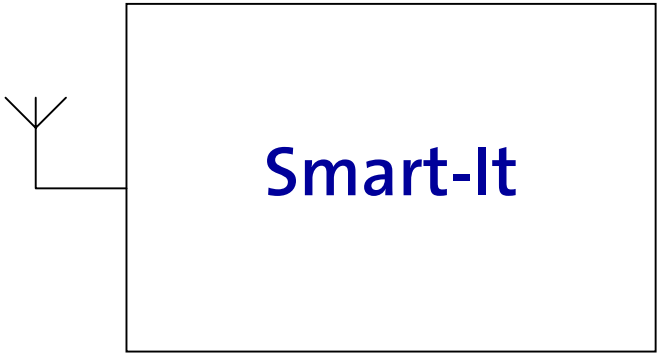






Smart-Its

Hardware



communication & sensing
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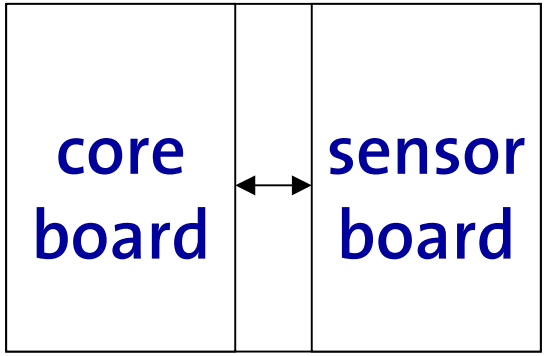
Smart-It

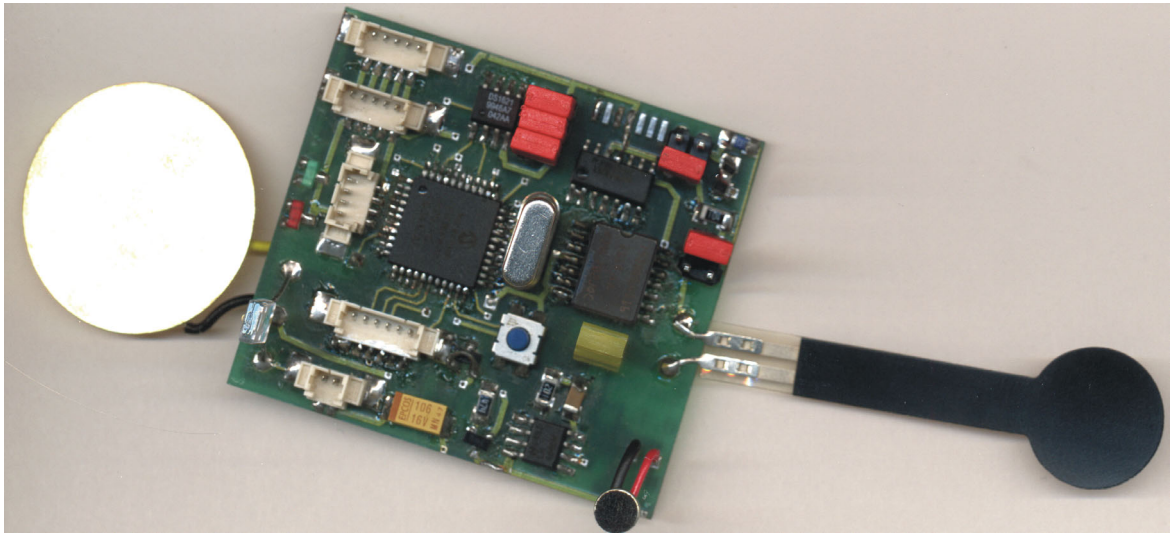


communication
computation

sensing
computation

Sensor board

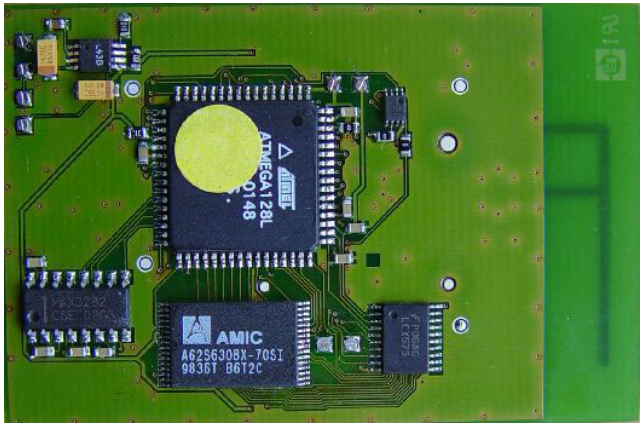
- temperature
- microphone
- 2-axis accelerometer
- pressure
- light
- microcontroller
- speaker
- LEDs

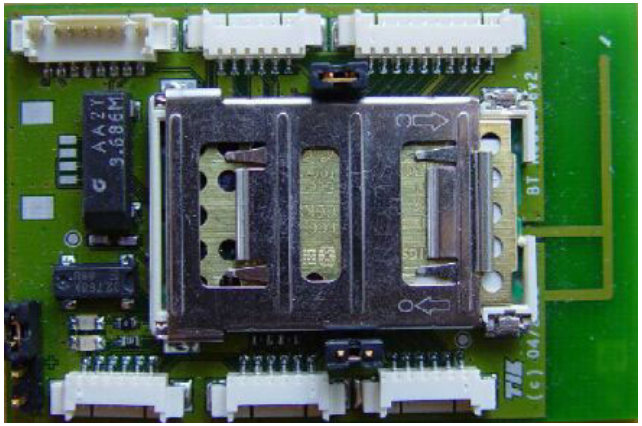


Smart-It sensor board (TecO)

Core board

- Bluetooth Smart-It
  - 8-bit microcontroller, 8 MHz/ 8 MIPS
  - 64 Kbyte RAM
    50 Kbyte EEPROM
    128Kbyte FlashROM
  - Bluetooth radio
  - Antenna on PCB
  - Input/ Output
    - sensor board
    - analog in, UART, ext inerrupts, programming





Bluetooth Smart-It (ETH Zurich)

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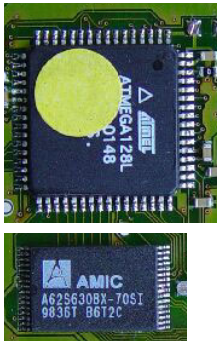

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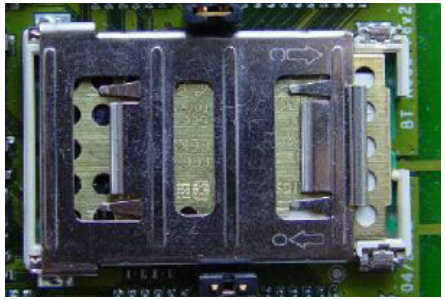

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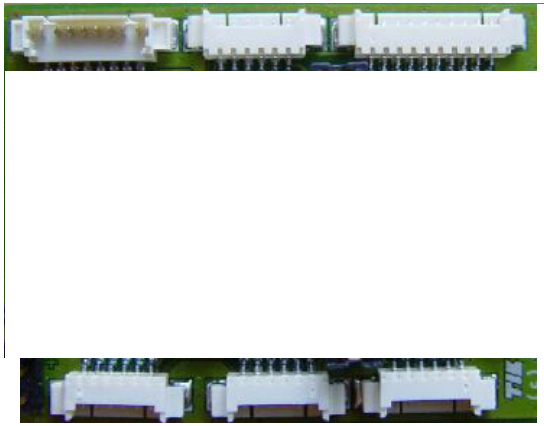
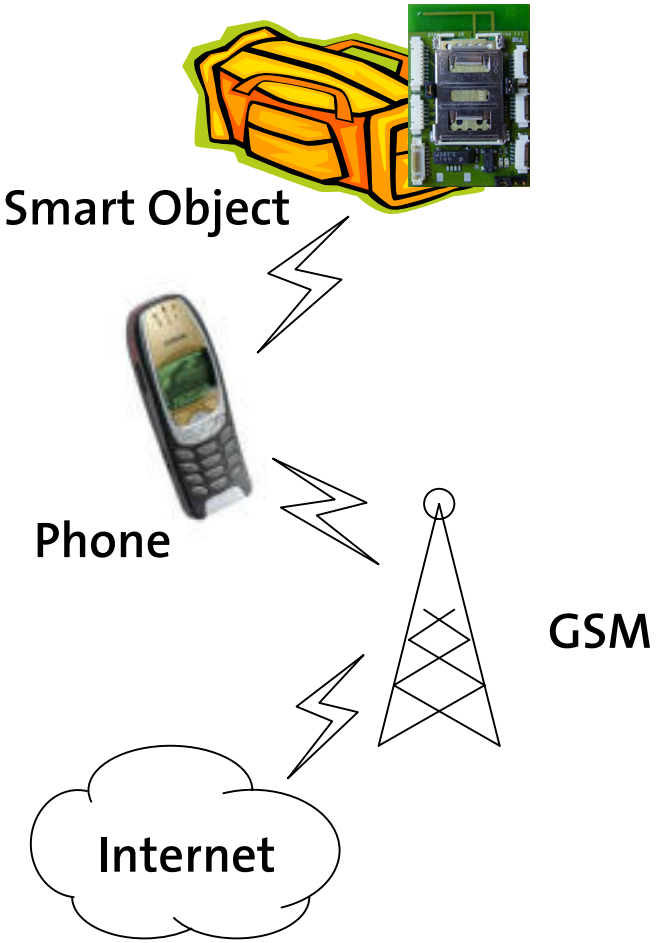


Bluetooth Smart-It (ETH Zurich)

Connect the World

- other smart objects ☑
  or infrastructure ☑
- Bluetooth phone
  - send/ receive SMS ☑
  - access Address book ☑
  - connect to Internet ☐
- PDA (iPAQ), ☑
  camera, printer,... ☐



Programming

- in C with GNU gcc cross compiler
  - straightforward
  - `malloc()` and `printf()` (to serial port)
- compile, upload, (run)
  - in-system programmable
- system software (library)
  - drivers: UART, RTC, Bluetooth, ...
  - event driven programming model

Status

- production
  - 200 pieces for project partners now
- can I have them?
  - no DIY (you will need to have them made)
  - design documents on the Web
    - http://www.tik.ethz.ch/~beutel/
  - ~ 200: 120€ pp for core board
    - Bluetooth (50 €), microcontroller (12 €)
    - PCB, placement (high initial cost)

Power consumption

- core-board @ 8MHz/ 3.3 V

Bluetooth off

idle	13	mW
active	40	mW
idle	84	mW
active	191	mW

Bluetooth on

on typical phone battery (600mAh)
~ 1 week idle
~10 hours running

Thanks

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